

HIP ARTHRITIS & OTHER DISORDERS: SURGICAL TREATMENT OPTIONS FOR THE PAINFUL HIP

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**Please read this guide before your visit so we can better answer
any questions during your consultation.**

Joint replacement is one of the most successful procedures in modern medicine. The surgical treatment of hip arthritis and other disorders by hip replacement is typically very reliable in reduction of pain and improvement in function. Total (also known as full or complete) hip replacement (THR) involves removal of the ball of the hip joint and resurfacing of the socket portion where the hip articulating surfaces are exposed, usually due to severe cartilage wear or joint damage. The ball and socket are replaced with metal on both sides, and a durable plastic placed in between. As such, there is no more bone rubbing on bone, but rather metal or ceramic articulating with a new plastic bearing, thereby re-establishing the joint mechanics and dimensions. This guide is intended to provide information regarding total hip replacement, less invasive surgery, risks and benefits of the procedure, outpatient joint replacement, and state-of-the-art surgical techniques.

THE EVOLUTION OF HIP REPLACEMENT

Prior to the availability of hip replacement surgery, hips with severe arthritis or other disorders were typically treated with walking aids, medications to manage symptoms, or hip fusion. While these treatment options could alleviate pain, each are associated with significant limitations and complications.

The earliest recorded attempts at hip replacement occurred in Germany in 1891 where ivory was used to replace the ball of the hip joint that had been destroyed by tuberculosis. In the late 19th century, surgeons experimented by putting various tissues in between the surfaces of the arthritic hip to make up for lost cartilage. In 1925, an American surgeon tried covering the ball with glass. In 1953, a metal-on-metal prosthesis was used as a hip replacement. Sir John Charnley is considered the father of

modern hip replacement from the 1960's. Hip replacement surgery involves replacing the articulation of the hip ball-and-socket joint, including the femoral head of the thigh bone and the acetabular socket of the pelvis. This is why the procedure is called a total, complete, or full hip replacement.

Throughout the years, the materials used in hip replacement have continued to improve. The metal surfaces are often comprised of cobalt-chrome and titanium. The metals must be durable to last for years, if not decades, and must be well tolerated by the body. The femoral stem component (attaches to the inside of the upper thigh bone) is made of titanium and the new femoral head made of cobalt-chrome or ceramic (because it must be scratch-resistant), as it articulates with the plastic surface of the socket. The durable plastic is a highly-crosslinked ultra-high molecular weight polyethylene that has properties to maximize strength while minimizing wear. It must be able to last the many years expected, and the many hip cycles expected throughout the patient's lifetime. The acetabular component (the resurfacing of the socket) is made of titanium and the plastic liner locks into it, so that motion does not occur at that interface.

Historically, both the stem and socket components were cemented into place, similar to knee replacement prostheses. Over time, it was discovered that cementless, or "biologic", fixation allows bone ingrowth into the components. This biologic fixation can be rigid once ingrown, and also has the potential to be dynamic, since bone can remodel unlike its cemented counterparts. However, cementless fixation requires initial rigid stability and time to allow the bone ingrowth process to mature and complete. Modern cementless techniques of both the stem and acetabular components have shown over 90% survivorship past 20+ years.

Virtually all acetabular components are placed in a cementless fashion. In cases of severe osteoporosis or poor bone quality, the femoral stem can be fixed with cement, which eliminates fracture risk, and allows immediate stem fixation. This "hybrid" hip replacement is when the socket is fixed without cement and the thigh piece is fixed to the femoral bone with cement. ^{*,†}

* "Results of modern hybrid primary total hip arthroplasty in a comprehensive joint replacement program"

• Presentation by **Alexander Sah, MD** at *Western Orthopedic Association Meeting*, Waikiki, 2011

† "To Cement or not to Cement? Modern Hybrid Total Hip Replacement - Low risks and excellent results with cemented femoral fixation"

• Poster by **Alexander Sah, MD** at *AAHKS Annual Meeting*, Dallas, 2016

MINIMALLY INVASIVE SURGERY

Traditional hip replacement surgery, in practice since its beginning in the 1960s in the United States, has typically utilized an extensive, 8 to 12 inch incision on the side of the hip. Exposure into the hip joint requires dissecting through the soft tissues and entering the hip joint capsule. While exposure is excellent, and makes the hip replacement surgery easier, the muscle and soft tissue trauma associated with this exposure can result in weeks to months of recovery.

About 15 years ago, minimally invasive hip replacement techniques gained popularity. The intention was to minimize soft tissue injury, to allow a faster recovery, while maintaining the excellent and durable outcomes of traditional surgery. MIS surgery is more difficult to perform, which is why not all surgeons use the technique. Studies have shown that the majority of joint replacements in the US are performed by surgeons who perform fewer than 30 cases per year. Studies also show that joint replacements done by high-volume surgeons and at high-volume institutions have better results and fewer complications. As a result, MIS hip replacement surgery should be performed only by a specialist.

During this time, many different surgical approaches have been explored, each with its own specific advantages and disadvantages. The lateral, or side, hip surgical approach historically involved a controlled fracture (osteotomy) of the trochanter including the insertion of the hip abductor muscles (analogous to the rotator cuff of the shoulder). This required bone reattachment which carried associated risks of improper bone healing and a postoperative limp. An anterolateral, slightly more anterior, approach avoided bone osteotomy, but instead detaches the anterior third of the hip abductor muscle off of the bone. While the approach provides excellent hip stability, it also leads to at least a temporary limp, because of the dissection through the hip abductor musculature. An approach again just slightly forward to this one, a modified Watson-Jones anterolateral approach, promotes many of the same advantages, and avoids abductor damage because it enters the hip joint just in front of this muscle group. However, the technique is challenging for exposure in the operating room, requiring multiple assistants and extensive leg manipulation. Because exposure is more difficult, it can be more challenging for accurate component placement. Dr. Sah has

performed each of these previously described approaches, but has found them to be less advantageous than the other surgical techniques described next.

The mini-posterior approach is a modification of the standard posterior hip surgical technique. It is reduced to typically a 3-4 inch incision with less soft tissue dissection to the hip joint. In contrast to the standard approach, more muscle and soft tissue is left intact, and any tendons or capsule are repaired at the end of the case. However, by definition, this approach cuts through muscle that is repaired at the end of the case. While modern techniques lower the hip dislocation rate compared to standard posterior hip techniques, its greatest limitation remains its hip instability risk due to muscle dissection. Because this modified approach is based on the traditional posterior technique, it is easily extensible if needed, thereby allowing appropriate hip exposure in the rare occurrence of an intraoperative complication, unexpected complex hip anatomy, or revision procedures. As such, this approach is more commonly reserved for complex or revision surgeries that are not amenable to other less invasive and muscle-sparing approaches, like the direct anterior approach. Since 2008, Dr. Sah's patients were able to be safely discharged home the day following posterior hip surgery. In 2017, he initiated novel protocols for the Institute, following the pattern of his partial and total knee replacement patients, and was the first surgeon to perform outpatient posterior hip replacement for select patients.^{#§} While very successful, Dr. Sah adopted the anterior hip approach later that same year due to the advantages listed below.

An anterior hip approach is anatomically unique in that it is muscle-sparing rather than muscle-cutting, with fewer precautions after surgery. This preservation of the muscle groups provides inherent stability to the joint, providing a significant advantage over the other approaches. In addition, by going in between muscle groups rather than through them, this approach can lead to faster recovery. This approach continues to grow in popularity and increasing literature and research shows benefits of less pain, faster recovery, and improved hip stability. In fact, the anterior hip approach is now the predominant approach used by hip specialists in the US because of these

¹ Alexander Sah, "Same Day Surgery- Top 5 Tips for Outpatient Joint Replacement"
• Presentation at CA Orthopedic Assoc Annual Meeting, Carlsbad, 2017

[§] Alexander Sah, "Outpatient Joint Replacement: Practical guidelines for your program based on evidence, success, and failures"
• Moderator at AAOS Annual Meeting, New Orleans, 2018

clinical benefits. Rarely, nerve injury is reported with this approach that may lead to permanent numbness, and infrequently pain, in the front of the thigh. Nonetheless, this approach has gained rapid and steady public interest because the outcomes have often been accelerated and superior compared to standard techniques. Because xray is uniquely used during the procedure, implant size and fit can be optimized real-time and leg lengths can be adjusted within millimeters; another significant advantage over the other surgical techniques. In many patients this approach may be appropriate, but factors such as hip stiffness, severity of hip disease, and body habitus can influence risks and complications. Dr. Sah has been trained by Dr. Joel Matta in this technique and lectures at the annual Anterior Hip Foundation meetings and serves as faculty at surgeon training courses.** Discussing this approach with a surgeon who currently performs the procedure would best determine whether a particular patient is a proper candidate. Drs. Sah and Bonner are the only surgeons at the Institute to have ever performed the technique.

The incision locations for some of the common surgical approaches are depicted below.

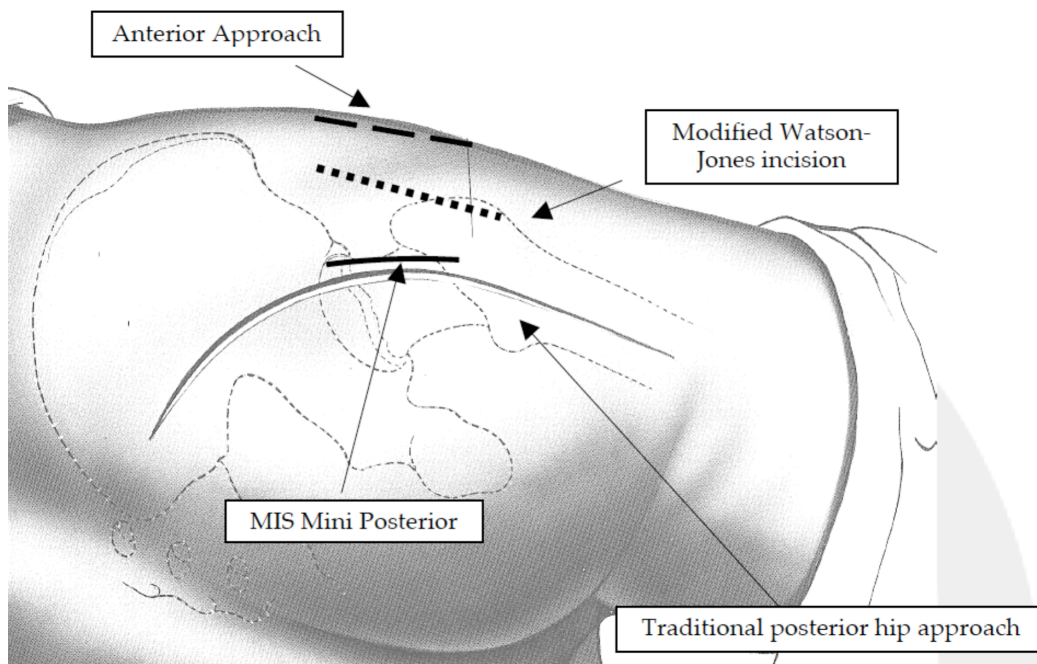


Illustration of patient lying left side down, right hip shown from behind

* Faculty/speaker at *Anterior Hip Foundation Meeting*, Las Vegas 2017

ADVANTAGES

Minimally invasive hip replacement surgery can lead to a more rapid recovery, with less blood loss and pain, and faster return to activities. Earlier ambulation lowers complication risks including blood clots, muscle atrophy, or gait disturbances. Often, hip replacement patients will remark that the artificial joint feels normal to them.

Hip pathology can also affect, or be affected by, arthritis or disorders of the lower spine. Frequently, hip and lower back pain can mimic each other, or over-compensate for the other. Restoring hip motion and improving gait and posture can often secondarily improve lower back symptoms. In addition, leg length inequalities due to shortening of the leg as a result of cartilage wear or hip flexion contractures, can be corrected with hip replacement.

Importantly, the benefits of hip replacement remain the same with improvement of hip stiffness, resurfacing the worn hip joint, and early return to function. The long-term goal is also the same, of providing the most long-lasting pain relief and improved mobility as possible. After surgery, patients are taught flexibility exercises to first maximize hip range of motion. In the second stage, leg strengthening helps restore the atrophied muscles in the leg from prior to surgery. Exercises begin immediately and continue at home under the guidance of a physical therapist. Patients often begin golf-like activities at 6 weeks after surgery, and can soon after return to hiking, biking, swimming, tennis, skiing, and other such activities. Most patients have little or no pain after their hip replacement procedure, and the vast majority have near normal mobility. For these reasons, nearly half a million hip replacements are performed in the US each year.

CONSIDERATIONS BEFORE SURGERY

As fast as the recovery has now become, we find it important to emphasize that hip replacement is still a significant surgical procedure. Whenever anesthesia is involved, there are potential risks. However, in nearly all patients, the preferred method is regional anesthesia, an epidural or spinal. This involves numbing the waist down, so that general anesthesia, and intubation, can be avoided. This minimizes anesthesia risks, as patients can remain awake, breathing on their own, or be sedated for the one-hour procedure. Nonetheless, prospective patients would benefit from optimizing their health prior to any elective procedure.

LIMITATIONS, DISADVANTAGES, AND COMPLICATIONS

As impactful as hip replacement is on improving quality of life, the components are limited because they are man-made. As such, while rare and unusual, there are limitations and risks to the procedure. First, while it may feel so, the hip replacement is not a “normal” hip. The implants are not made with the intention of withstanding significant hip forces associated with running, jumping, soccer, basketball, etc. Activities such as swimming, golfing, biking, doubles tennis, golf, skiing, and others are lower-impact and more recommended.

Second, the artificial materials can be subject to loosening or wear. These failure mechanisms are infrequent, but possible. Bone ingrowth is reliable in over 98% of patients, but loosening over time can occur. The plastic bearings can also potentially wear, though modern materials are so durable that this is rare. Polyethylene surfaces have been used for decades, with durability over 30 years in many cases. Most joint replacements will outlive the patient. Studies typically suggest that implant failure is less than 1% per year, meaning that over 80% of hip replacements should be functioning well over 20 years later.

While hip replacement used to be a procedure only for the elderly, the average age for the procedure continues to decrease. Younger, more active, patients are often wearing their hips faster and earlier, leading to the need for hip replacement as young as in their 40's. On the other side of the spectrum, the procedure is safe and effective for patient's in their 90's. The same rapid recovery protocol can be appropriate for both sets of patients, and those in between.

Specific risks to total hip replacement surgery include infection, bone fracture, joint stiffness, sciatic or femoral nerve or arterial injury, ligament or soft tissue injury, continued pain, fracture, heterotopic bone formation, hip instability, leg length discrepancy, or implant failure. These risks are rare, lower than 1% in most cases. Other medical complications from undergoing surgery include heart attack, stroke, kidney failure, blood clot, pulmonary embolism, heart failure, bleeding, nerve palsy, and others. Medical optimization prior to surgery helps minimize these risks. The most common complications are usually nausea or constipation from the pain medications. Some patients have pre-existing conditions that may increase their risk for

a particular complication somewhat, and consultation is necessary to assess these risks. It is important for patients and caregivers to be aware of these possible, though infrequent, risks to help with earlier identification and appropriate treatment.

All patients should understand that determining and achieving equal leg lengths in total hip replacement surgery is not an exact science. Occasionally, the leg lengths are not exactly what is planned or would be desired. This is usually because achieving equal leg lengths is counterbalanced with achieving hip stability. Data suggests that leg lengths within 5 mm of being equal is achieved in over 90% of patients. When the leg lengths are not equal after the operation, it may infrequently be helpful to wear a lift in the shoe. It is important to know that it is more common that after the operation, the patient may feel a leg length difference, even though there is not one. This is usually due to the newly adjusted hip muscles being tight, which can make the leg feel too long in some patients. With stretching and exercises, the muscles gradually lengthen and the legs wind up feeling equal, in addition to being equal. Of note, a significant benefit of anterior hip replacement is that x-ray is used during the procedure to assess component fit and placement, thereby also allowing real-time assessment of leg lengths.

THE FUTURE

With hip replacement already a very successful procedure, most advancements have centered on improving patient recovery and speeding rehabilitation. Drs. Sah and Bonner have a particular interest in optimizing pain and blood management strategies in joint replacement.^{††††§§} Improvements in pain management with a multimodal approach focuses on using many different medications at lower doses, to achieve an overall better analgesic effect. Advanced blood management strategies have essentially eliminated the need for blood transfusion, donation, or surgical drain use. Rapid recovery protocols have allowed 24 hour discharges, and in many cases same-day surgery with patients going home just hours after surgery. By participating as faculty at national meetings and continuing with research and leadership committees, Drs. Sah and Bonner are able to bring the most current treatment options and surgical techniques to their patients. .^{***††† ††† §§§****††††}

^{††} Alexander Sah, "Immediate Impact of Tranexamic Acid in Blood Conservation in Primary Total Joint Replacement"

• Presentation at ICJR 3rd Annual Pan Pacific Orthopedic Congress, Kona, Hawaii, 2016

^{††} Alexander Sah, "Blood and Pain Management in Modern Joint Replacement"

• Presentation at *Contemporary Solutions in Joint Surgery*, Salt Lake City, 2017

^{††} Alexander Sah, "The Use of Multimodal Analgesia in Treating Acute Pain"

• Presentation at HANA Annual Meeting- Oahu, 2015

^{***} *Multimodal Pain Management for Total Hip and Knee Arthroplasty: Current Concepts and Controversies 2016 Symposium*, Dallas, 2016

REOPERATIONS

Revision hip surgery is infrequent, but is required in some cases. If cement fails by loosening or fracture, or a cementless component loosens, a new component can replace the prior one. If the plastic wears, it can be changed in isolation, while leaving the surrounding metal components alone. Revision surgery is more complicated, takes longer to perform and recover, and is associated with an increase in complications and risks. However, hip revision can be performed safely, and since 2014 have been part of my same rapid recovery protocols as first-time hip replacement patients. In rare cases, some patients have had multiple revision surgeries on the same hip, and still are able to function satisfactorily. Everything is done to avoid the need for revision surgery in the future, but it can be performed safely when necessary.

CONCLUSION

Hip replacement surgery is one of the most successful procedures available in modern medicine. For patients with severe hip arthritis or other disorders, replacement restores function and alleviates pain. Patients can return to most activities and regain their active lifestyle. Durability is expected to achieve excellent results for decades.

Risks and complications are infrequent, and techniques and protocols are constantly modified to reduce risks even further. Involvement with research and participation in meetings is essential to remaining current in these evolving techniques. Even with the success of current protocols, Drs. Sah and Bonner continue to look for ways to improve patient outcomes and recovery.

The purpose of this guide is to provide a general understanding of hip replacement surgery and the associated benefits and possible risks. Hopefully, the information presented has answered some questions, and possibly generated new ones. We recommend that you read this guide thoroughly, and at your leisure prior to your consultation. We recommend that you discuss it with your family or caretaker. Please feel free to contact us if you have any questions.

^{†††} *Same Day Surgery- Road to Outpatient Joint Replacement Symposium, Dallas, 2016*

^{††††} *Optimizing the Episodes: Improving Total Joint Outcomes and Cost in the Era of CJR Symposium, Dallas, 2016 (moderator/speaker)*

^{†††††} *Contemporary Solutions for Joint Surgery, Salt Lake City, Utah, 2017*

^{††††††} *California Orthopedic Association Annual Meeting, San Diego, 2017 (program co-chair)*

^{†††††††} *AAOS, Annual Meeting, Instructional Course Lecture, Outpatient Joint Replacement, 2018*

You will be asked to sign and acknowledge that you have read and understood these materials prior to surgery. Please file a copy in your records and keep as a resource. Thank you for your interest and taking the time to read this guide. We look forward to meeting you soon.

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I have read this document entitled “Hip Arthritis & other Disorders: Surgical Treatment Options for the Painful Hip” under quiet conditions at my leisure away from Dr. Sah’s and Bonner’s office. I have discussed the information with those family members I feel should be aware of it. I understand its contents and accept the inherent risks in the surgery described.

Patient: Sign Your Name Here

Print Your Name Here

Date

Witness: Sign Your Name Here

Print Your Name Here

Date